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THE IMPACT OF ADVANCED NAVAL SURFACE FIRE SUPPORT  
ON JOINT FORCE FIRE COORDINATION

A thesis presented to the Faculty of the U.S. Army  
Command and General Staff College in partial  
fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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Fort Leavenworth, Kansas  
1997

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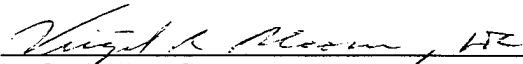
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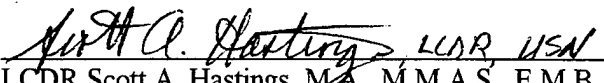
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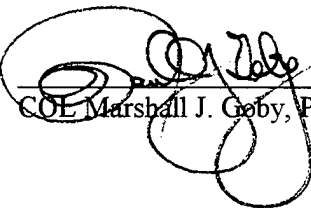
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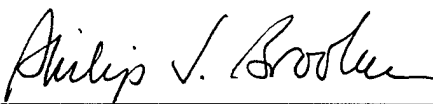
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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U. S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

## ABSTRACT

### THE IMPACT OF ADVANCED NAVAL SURFACE FIRE SUPPORT ON JOINT FORCE FIRE COORDINATION by LCDR George Bonsall, USN, 73 pages.

This study investigates the impact of advanced naval surface fire support weapons on the development of joint force fire coordination doctrine. The U.S. Navy is pursuing the acquisition of surface fire support weapons with extended ranges which will reach beyond traditional amphibious objectives. Therefore, doctrine may be required to address the integration of advanced naval surface fire support into ground commanders' operations.

The concept is that the acquisition of naval surface fire support missile systems and substantial improvements in naval gun weapon systems will add significant capabilities to joint fire support which may require coordination and integration methods beyond those provided by current joint doctrine.

Quantitative and qualitative analysis is accomplished to determine the relative impact of these naval surface fire support weapons systems and assess the relative need for modifications to current joint doctrine. It is suggested that current doctrine may not be sufficient. Further, there is a need for a joint fire support coordination or integration organization to ensure that improvements in surface fire support systems can be accommodated to ensure optimal application of combat power.

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## LIST OF ACRONYMS

AA	antiarmor
ACCP	Air Combat Command Publication
ACTD	Advanced Concept Technology Demonstration
AD	Air Defense
ADOCS	Automated Deep Operations Control System
AFATDS	Army Field Artillery Tactical Data System
ANGLICO	Air and Naval Gunfire Liaison Company
AIP	Advanced Improvement Program
AO	Area of Operations
ARTY	artillery
ASCM	Anti-Ship Cruise Missile
ASOC	Air Support Operations Center
ATACMS	Army Tactical Missile System
ATF	Amphibious Task Force
ATWCS	Advanced Tomahawk Weapon Control System
BAT	Brilliant Anti-Tank sub-munitions
BLK	block (version)
C2	Command and Control
C4I	Command, Control, Communications, Computers and Intelligence
CAS	Close Air Support

FY	Fiscal Year
GPS	Global Positioning System
IFSAS	Interim Fire Support Automated System
INS	Inertial Navigation System
IR	Infra-Red
JASPO	Joint Arsenal Ship Program Office
JFACC	Joint Force Air Component Commander
JFFC	Joint Force Fires Coordinator
JFFCC	Joint Force Fires Coordination Cell
JFLCC	Joint Force Land Component Commander
JP	Joint Publication
JPSD	Joint Precision Strike Demonstration
JSOTF	Joint Special Operations Task Force
JSRC	Joint Search and Rescue Coordinator
JSTARS	Joint Strategic Reconnaissance and Targeting System
JTCB	Joint Targeting Coordination Board
LAMPS	Light Airborne Multi-Purpose System
LCAC	Landing Craft Air Cushioned
LSD	dock landing ship
LF	Landing Force
LNO	liaison officer
MCRP	Marine Corps Reference Publication
MMAS	Master of Military Art and Science
MOE	measure of effectiveness

NDP	Naval Doctrine Publication
NFA	No-Fire Area
NGFS	Naval Gunfire Support
NSFS	Naval Surface Fire Support
NWCS	NSFS Weapon Control System
NWP	Naval Warfare Publication
P-3	Orion maritime patrol aircraft
PTA	Potential Target Area
RDT&E	Research, Development, Testing and Evaluation
RFL	Restrictive Fire Line
SACC	Supporting Arms Coordination Center
SAMS	School of Advanced Military Studies
SFW	sensor fused weapon
SH-60	Seahawk anti-submarine helicopter
SLAM	Standoff Land Attack Missile
SOP	Standard Operating Procedures
TACFIRE	Tactical Fires Direction System
TACP	Tactical Air Control Party
TLAM	Tomahawk Land Attack Missile
TSTAR	Tomahawk Stops The Attacking Regiments
TTP	Tactics, Techniques and Procedures
UAV	unmanned aerial vehicle
US	United States
USA	United States Army

USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
VGAS	Vertical Gun /Advanced Ship
VLS	Vertical Launching System
WAM	Wide Area Munition

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CHAPTER 1  
INTRODUCTION

The United States Navy is currently pursuing acquisition goals which will provide naval surface fire support (NSFS) weapons with advanced capabilities, including very extended ranges. These advanced capabilities will require coordination in order to maximize combat power and minimize redundant efforts in joint land combat operations. As weapons technological advancements have improved the armed services' capabilities to apply combat power across a broader depth of the battlefield, the requirement to coordinate the employment of these capabilities has increased. Current joint doctrine addresses the establishment of functional commanders and coordinators, such as the Joint Force Air Component Commander (JFACC), to command and control a wide variety of joint operations. This thesis intends to answer the question, "Will the acquisition of advanced Naval Surface Fire Support (NSFS) weapons require a significant change in the way fire support is coordinated, specifically, the establishment of a Joint Force Fire Coordination Cell (JFFCC)?"

The U.S. Army's capstone doctrine publication, Field Manual (FM) 100-5, Operations, provides that deep operations are actions directed against enemy forces beyond those that are in immediate contact with friendly forces, known as the close battle. Operations are best conducted across both close and deep operations' areas. "A well-orchestrated deep battle may help to cause the enemy to be defeated outright or may prevent him from achieving his intended objectives."<sup>1</sup> The fielding of the Army tactical missile system (ATACMS) and of the advanced helicopter

systems, in particular, has resulted in the development of extensive tactics, techniques, and procedures to support the Army's deep operations.

The U.S. Navy has provided NSFS by naval gunfire for U.S. Marines and the U.S. Army since the dawn of their amphibious operations. This support was limited to shore bombardment, as even the formidable sixteen-inch guns of World War II era battleships could not range much farther than twenty nautical miles. Recent technological developments may provide the U.S. Navy with the capability to significantly increase the reach of NSFS. A number of proposals are being considered for the acquisition of weapons which would increase this reach to 150 nautical miles and beyond. These weapons include: extended range guided munition system (ERGMs), a naval version of ATACMS, and an antiarmor version of the Tomahawk cruise missile, among others. Testing of ATACMS from a ship at sea was successfully accomplished in 1995, aboard the U.S.S. Mount Vernon (LSD-39).<sup>2</sup>

Clearly, if these new weapon systems, with a significant increase in battle space, are fielded by naval forces, doctrine, tactics, and procedures must be developed to support their employment. Naval forces employ fire support for amphibious operations in accordance with the supporting arms doctrine delineated in Joint Publication 3-02, Joint Doctrine for Amphibious Operations. The supporting arms scheme provided is aimed at amphibious task force (ATF) operations and is not in perfect concert with the deep operations doctrine and procedures as developed by the U.S. Army. Therefore, doctrine must be established to support naval surface fire support if its range capabilities will encompass the Joint Force Land Component Commander's (JFLCC's) area of operations.

An excellent model for comparison of the coordinating functions and responsibilities of joint fire support is the JFACC. The JFACC is generally designated by the joint force

commander (JFC) to provide “command and control (C2) of joint air operations throughout the range of military operations to ensure the unity of effort for the benefit of the joint force as a whole.”<sup>3</sup> The evolution of the JFACC provides the impetus for the thesis research question. “The JFACC directs this exploitation (of joint air operations capabilities) through a cohesive joint air operations plan (centralized planning) and a responsive and integrated control system (decentralized execution).”<sup>4</sup> The JFACC was developed to coordinate multi-service efforts where aircraft weapon systems capabilities crossed service or functional commanders’ boundaries. As NSFS evolves, a similar situation may develop.

The magnitude of joint air operations necessitated the development of the JFACC using a very complex organization of personnel and computer systems. The establishment of a JFACC requires considerable resources. A JFACC may include over one thousand people. The contingency theater air planning system (CTAPS) is the primary computer system for joint air operations planning. The CTAPS is a complex computer network which can be connected by land line, microwave, or satellite communications. The CTAPS is found at numerous Air Force headquarters, Air Force wings and squadrons, and Marine Corps wings and squadrons and on aircraft carriers and amphibious assault ships. This complex system evolved to consolidate the planning for all air operations in a joint force.

Should joint fire support coordination doctrine develop a structure similar to that of joint air operations, it would likely consume considerable resources as well. Therefore, as NSFS capabilities advance, their relative impact must be studied to determine the appropriate level of involvement. If advanced NSFS will be providing significant fire support throughout the depth of the battlefield across service or functional commanders’ boundaries, then a complex organization of personnel and support systems may be warranted or may be included in the

JFACC process. Conversely, if the new weapon systems equate to little more than an extended range shore bombardment, then perhaps the current supporting arms coordination doctrine will be sufficient. However, some form of joint organization or coordination might still be necessary if these weapons' ranges extend beyond the JFLCC boundaries.

### Advanced Naval Surface Fire Support Systems

While preparing the Fiscal Year 1998 budget requirements, the office of the Chief of Naval Operations identified two essential warfighting tasks of the future: land attack and theater air supremacy.<sup>5</sup> Three programs which show promise of being fielded in the near term include: the ERGMS, a naval version of ATACMS, and an antiarmor version of the Tomahawk land attack missile (TLAM BLK IV(AA)). The ERGMS is expected to be operationally tested in late 1999 and therefore fielded in 2000.<sup>6</sup> TLAM BLK IV(AA) can be operational by 2004.<sup>7</sup> Several missiles are being considered as options for development as a NSFS missile. Reliable performance data for these systems is not currently available. As ATACMS is a mature weapon system, designed for land attack fire support, and tested at sea as mentioned above, this study will confine its research to the ATACMS option.

An important development in providing a platform for the new weapons programs necessary to support land combat operations is the arsenal ship concept. "The Defense Advanced Research Projects Agency (DARPA) and the Navy are partners in the Joint Arsenal Ship Program Office."<sup>8</sup> The program is officially described as "a direct outgrowth of the Navy's shift in focus from the open ocean to the littoral," as established in the Navy /USMC 'Forward . . . from the Sea' . . ."<sup>9</sup> The arsenal ship would be equipped with a vertical launching system with a capacity of 500 missiles.

The Navy is considering building six arsenal ships with three forward deployed at any one time. One arsenal ship would, therefore, always be available to a theater commander for contingency operations. Current plans would result in an operational test around 2000, with the construction of the ships to commence in 2001.<sup>10</sup> The arsenal ship will not be the only ship capable of advanced missile NSFS as “by the end of the decade the USN’s fleet will possess 7,000 VLS cells.”<sup>11</sup>

#### Extended Range Guided Munitions

The only naval gun designed for NSFS currently in the Navy’s inventory is the five-inch/54 caliber Mark 45 gun system. It is found on cruisers and destroyers. Its range is limited to approximately thirteen nautical miles. Modern amphibious doctrine with the landing craft air cushioned (LCAC) and helicopters stress initiating operations from beyond the horizon. This doctrine, coupled with the threat of modern antiship cruise missiles (ASCMs), generally require an ATF to be twenty nautical miles or greater from land to ensure surprise and to protect the ATF. The typical range of artillery is approximately sixteen nautical miles. Therefore the minimum desired range of the improved naval gun system is forty-one nautical miles.

“The ERGM [will achieve] a range far in excess of current ballistic projectiles through the use of rocket assisted propulsion, aerodynamic shape, glide and increased initial velocity . . . and a Mark 45 gun modification.”<sup>12</sup> The gun barrel is being redesigned to a five-inch/62 caliber configuration. The intent of the program is to exceed the minimum desired range of forty-one miles with an objective range of sixty-three nautical miles which will allow Navy ships to fire NSFS from twenty-five nautical miles offshore and conduct counterfire missions versus enemy artillery. Accuracy of the ERGM round will be achieved through a Global Positioning System

(GPS)/Inertial Navigation System (INS) coupled guidance set. It is planned for the payload to include seventy-two XM-80 types of submunitions.

Beyond ERGM is the vertical gun/advanced ship (VGAS) system. This system is composed of a 155-millimeter gun and automatic loading system placed vertically below the main deck of the ship. The advantages of this system include: lower radar, infrared, and optical signatures; a fixed barrel which can be supported along its length, rather than just at its trunnions; and easier liquid cooling. More importantly, for this study, the "gun's designers estimate that such a gun could deliver seven times the payload of the five-inch ERGM to seventy-five miles, or double the ERGM's payload to two-hundred miles."<sup>13</sup> The VGAS is in the concept stage, while ERGM and the 5-inch gun modification's research, development, testing and evaluation is funded at over \$32 million for fiscal year 1997.

#### Naval Version of the Army Tactical Missile System

Advanced NSFS gun systems will have the capability to influence combat operations in the immediate vicinity of an amphibious objective. A missile system is necessary for NSFS to alter the deep battle. Several missile options are being considered to provide NSFS capabilities at ranges close to 200 nautical miles. These include: the sea standoff land attack missile (SLAM), standard missile, and the ATACMS.

The sea SLAM is a variant of the Harpoon antiship cruise missile which is fired from a surface ship and guided to a target by an aircraft. "Two [successful] demonstration shots . . . were conducted off the California coast in April [1996] and directed to target by an F/A-18 [fighter] in one case and a LAMPS Mark 60 [helicopter] in the other."<sup>14</sup>

Sea SLAM uses a unitary warhead, requires significant preprogramming and terminal guidance from an aircraft, and can only be launched from Harpoon missile launchers. These

limitations make sea SLAM an unlikely candidate for NSFS. The unitary warhead would need to be replaced with a submunition and preprogramming reduced. The aircraft terminal guidance requires significant coordination, and there are only eight canisters available in the standard Harpoon missile launcher which must be shared with Harpoon missile requirements, therefore limiting inventory.

Standard missile is the Navy's area air defense missile. A demonstration firing of this missile in a strike variant was planned for late 1996.<sup>15</sup> Results are not currently available. The "Standard Strike" would be ballistic, fly to a GPS location, and dispense a submunition warhead. The advantage of standard missile is that it is already integrated into the vertical launching system (VLS) used in cruisers and destroyers and planned for the arsenal ship. But its current warhead is specifically designed for air defense, and its aerodynamics optimized for supersonic intercepts.

The ATACMS is the Army's premier deep battle missile system. It flies a ballistic profile with a GPS/INS guidance set and dispenses a submunition warhead at the target over seventy-five nautical miles away. It was proven in Operation Desert Storm, and a naval version was to be tested from a VLS at White Sands Missile Range, New Mexico, in late 1996.<sup>16</sup> Improved ATACMSs are expected to have ranges in excess of two-hundred nautical miles. In 1994 \$18.7 million was awarded to Loral Vought to develop the naval version of ATACMS.<sup>17</sup>

#### Tomahawk Land Attack Missile Block IV, Antiarmor Version

The Tomahawk Land Attack Missile (TLAM) may be launched from Navy ships or submarines, cruises over 500 nautical miles, has GPS/INS and digital scene matching and correlation guidance features, and packs either a unitary warhead (TLAM-C) or a set of 166 distributed BLU-97/8 submunitions (TLAM-D). It has been used successfully in Operation

Desert Storm and in four contingency operations. One significant limitation of the TLAM is that its current configuration requires that it be used against fixed sites, due primarily to the lead times required to program mission data sets for the missile.

Studies by the Department of Defense and a RAND project have shown that an enemy force with between 3,000 and 8,000 armored vehicles could overwhelm a friendly force despite intervention by the United States with carrier-based and U.S. based aircraft.<sup>18</sup> As a result of these studies a Mission Need Statement was drafted by the Department of Defense for a forward-deployed capability to neutralize massed armor in a regional conflict. Tomahawk land attack missile block IV, antiarmor version (TLAM BLK IV(AA)), originally known as Tomahawk stops the attacking tegiments (TSTAR) was conceived to fill this need.

TLAM BLK IV(AA) takes advantage of the success of the Tomahawk program and a number of other joint acquisition programs for smart submunitions and sensor systems. It will use the TLAM-D configuration with planned improvements in route planning, interfaces to sensor and intelligence sources, and a highly interactive human-machine interface. The planned improvements in route planning include automation which will significantly reduce planning time and allow the system to be considered for attacks on mobile systems. Rather than the 'dumb' BLU-97/8 submunitions, the TLAM BLK IV(AA) would deliver either the sensor-fuzed weapon (SFW), the brilliant antitank submunition (BAT), or the wide-area munitions (WAM) at low altitudes at a target area. The SFW, developed by the Air Force, uses an infrared (IR) sensor combined with an explosively formed projectile (EFP) to destroy armored vehicles with homogeneous rolled steel or reactive armor. The BAT, developed by the Army for use in ATACMSs, detects its target with an acoustic sensor array, and then guides its tandem-shaped charge to the target with an IR seeker. Rather than being dispersed over the actual targets, as is

SFW and BAT, WAM is distributed as a mine with a seismic/acoustic sensor, IR sensor, and an EFP. Each submunition has the capability to discriminate between targets. Connectivity with the Air Force's joint strategic targeting and reconnaissance system (JSTARS), Predator unmanned aerial vehicles (UAVs), U-2 reconnaissance aircraft, P-3 (AIP) maritime patrol aircraft, or other reconnaissance assets will provide targeting data.<sup>19</sup> The TLAM BLK IV(AA) will be an effective addition to NSFS providing antiarmor capability beyond five hundred nautical miles.

#### Command, Control, Communications, Computers, and Intelligence

Development of Command, Control, Communications, Computers, and Intelligence (C4I) systems is being conducted in parallel with weapon systems developments to ensure that control of the advanced NSFS weapons will ensure interoperability with other services and support systems. TLAM is controlled on ships with the advanced Tomahawk weapon control system (ATWCS). Due to its open architecture, high-order computer language, and common operating environment features, it appears that ATWCS will evolve into a multi-weapon control system, the basis for the NSFS warfare control system (NWCS), to control all offensive weapons from a ship. ATWCS would control TLAM-C and -D, TLAM BLK IV(AA), the NSFS missile (ATACMS or other), five-inch gun system with ERGM, sea SLAM, and other weapons.<sup>20</sup>

The Army and Marine Corps are developing the advanced field artillery tactical data system (AFATDS) to replace the tactical fire direction system (TACFIRE) and the interim fire support automated system (IFSAS) as their C4I system for the control of fire support. AFATDS is expected to be used in all tactical echelons of the Army and Marine Corps.<sup>21</sup> The Army has also developed the automated deep operations coordination system (ADOCS) to process

targeting data horizontally between systems and cells within a headquarters. "ADOCS has revolutionized and greatly simplified planning, coordination, and execution within the corps' Deep Operations [Coordination] Cell."<sup>22</sup>

Integration of NSFS C4I systems with the Army and Marine Corps systems has begun. A demonstration completed in Combined Joint Task Exercise (CJTTFEX) 96 in April and May of 1996 showed that a forward observer could communicate target data via a digital data link to a Navy destroyer for direct support missions.<sup>23</sup> The Joint Precision Strike Demonstration (JPSD) Counter Multiple Rocket Launcher (CMRL) Advanced Concepts Technology Demonstration (ACTD) is a project which has highlighted joint fire support coordination between ATWCS and ADOCS, using a purely digital exchange of data via the Common Operating Environment (COE) and standard message processing. The ATWCS was able to receive, process, display, generate, and disseminate TACFIRE messages as well as situational awareness updates and overlays in order to digitally coordinate fires between the Army and the Navy.<sup>24</sup>

#### Doctrine, Tactics, and Procedures

Joint fire support doctrine is under development. It is the intention of this thesis to assist in its formulation by examining the relative impact of advanced NSFS on the whole. A general review of service doctrine as it relates to fire support is necessary for a basis. Fire support doctrine and procedures are well developed in three areas: supporting arms coordination for amphibious operations, Army deep operations, and Army and Marine Corps targeting procedures. Doctrine is being established for naval fire support beyond supporting arms by the Naval Doctrine Command.

Joint doctrine for coordination of targeting is well established. Though a targeting process is found within each component and at many levels, a JFC will normally establish a Joint

Targeting Coordination Board (JTCB). The JTCB is comprised of members of the JFC's staff, representatives from each component, and others. The purpose of the JTCB is to provide a macro-level view of an operation and ensure that targeting nominations are consistent with the JFC's operational plans. The JTCB will meet regularly to review component targeting plans and may have approval authority for target priority lists.

### Supporting Arms Coordination

Supporting arms are air, land, and sea weapons employed to support ground combat operations. In amphibious operations the principal supporting arms are air, attack aviation, naval surface fire, and artillery. A coherent scheme of attack must be developed for the application of supporting arms "to establish a logical sequence that will attain cumulative results in increasingly favorable conditions."<sup>25</sup>

The Commander Amphibious Task Force (CATF) is responsible for establishing a Support Arms Coordination Center (SACC) to plan and execute the employment of all supporting arms. The Commander Landing Force (CLF) is responsible for establishing a fire support agency, Fire Support Coordination Center (FSCC) for a Marine Corps landing force and Fire Support Element (FSE) for an Army landing force, which is responsible for discharging and implementing landing force (LF) fire support coordination. The CLF is responsible for integrating supporting arms into the scheme of maneuver and coordinating supporting arms requests to CATF. Although these agencies; SACC and FSCC or FSE, work close together to achieve the amphibious objective, they are separate organizations run by their respective service component commander. A joint agency is not established to coordinate fire support or supporting arms in amphibious operations. Rather, liaison officers are assigned to facilitate communications between the agencies.

## Army Deep Operations

Army deep operations are best represented at the corps level. "Corps deep operations are directed against enemy forces and functions beyond the close battle [engagements of major maneuver forces] . . . against the enemy's uncommitted forces or resources . . ."26 The goals of deep operations are to shape the close fight by creating conditions favorable to friendly forces, including the destruction of the enemy's will to fight. The forces and systems available to a corps for deep operations include: field artillery (including cannon, rockets, and missile artillery), Army aviation, air assault and airborne forces, special operations forces, air assets apportioned to the corps by the JFACC or other commander, and other assets.

Careful and continuous synchronization of deep activities is necessary to ensure that the commander's intent is accomplished. An ad hoc organization would be inefficient and inappropriate for the magnitude of deep operations that a corps executes. Therefore, a Deep Operations Coordination Cell (DOCC) is established in the main command post to plan and execute deep operations. While the DOCC may be tasked to interface with the JTCCB, if a JTCCB exists, and may have liaison officers from the other services in its organization, the DOCC is an autonomous organization and is not a joint agency.

## Common Ground

While the application of fire support may appear doctrinally different between the two U.S. ground forces; the core of fire support, supporting arms, or deep operations is targeting methodology. It is in targeting methodology where the two services have come to agree as to the doctrinal approach even to the point of sharing common manuals. "Targeting is the process of selecting targets and matching the appropriate response to them on the basis of operational requirements and capabilities."27 The targeting methodology is based on four functions:

decide, detect, deliver, and assess. The key to successful targeting is understanding the targeting objectives and ensuring that the process is integrated into the command decision cycle.

### Naval Fires

Naval fires is a concept that is evolving to support integration of strike, interdiction, supporting arms coordination, and airspace deconfliction functions. Central to the concept is the Engagement Integration Center (EIC). It is analogous to the Joint Force Fire Coordination Cell (JFFCC), which should be defined in Joint Publication 3-09, Doctrine for Joint Fire Support, when it is promulgated. However, the emphasis is on integration vice coordination to achieve mission success.<sup>28</sup> The EIC concept is immature but illustrative of the direction that NSFS may be headed. The answer to the research question, “Will the acquisition of advanced NSFS weapons require a significant change in the way fire support is coordinated, specifically, the establishment of a JFFCC?” is necessary for further joint fire support coordination concept development.

### Limitations

The only limitation to conducting this research is that the topic is very ‘hot.’ The Naval Surface Fire Support Program Office, the Joint Arsenal Ship Program Office, Naval Fires concept, and development of TLAM BLK IV (AA) are all very new. This area is one of the few where funds are being increased. The overarching joint doctrine for fire support is still in draft. Much of the work is being conducted within a very limited network of organizations with only key milestone achievements being published. Much of the communication between interested parties is by electronic-mail and conferences. Therefore it will be impossible to keep abreast of

all developments. It is the intent of this study to maintain as current as possible to ensure its relevance to the problem.

### Delimitations

This study is focused on the U.S. Navy's advanced NSFS systems and how they might be integrated into the joint land combat operations. While the JFACC will be considered for comparative purposes, the effects of air forces will not be considered in the research methodology. It is not the intent of this study to determine the relative worth of the NSFS systems which may be acquired. Rather, the study will attempt to determine the relative impact of these systems if they are acquired and how that impact may shape the command and control doctrine of fire support.

This study will concentrate on three systems: the ERGMS, the naval ATACMS, and the TLAM BLK IV(AA). These three systems represent the breadth of possibilities and are the most likely to be fielded in the relatively near future. It must be understood that fiscal realities may cause the death of a procurement program for many reasons and with little warning, even if a system has great potential on the battlefield.

The conditions under which this thesis will be written necessitate that only open source information is used. No classified information will be used to develop any argument. As the relative vice the definitive impact of advanced NSFS is the heart of the thesis question, the use of open source material is considered adequate. An added benefit of not using classified material is that wide dissemination is possible.

This research will not concentrate on tactics and specific procedures. Rather, it will use selected tactics and procedures for illustrative purposes and discuss them in general terms. The evolution and automation of certain tactics and procedures will increase the effectiveness and

responsiveness of weapons systems. Therefore a review of the coordination processes will be required.

### Significance of the Study

There are numerous issues under study that will affect the development of NSFS systems and their command and control. The transition from shore bombardment at thirteen nautical miles to countering armored attacks at greater than five hundred nautical miles makes the resolution of these issues critical to ensuring that the new systems are employed effectively and efficiently.

As the Army shifts from a forward-deployed force to a force-projection army, it is essential to have joint doctrine and procedures as component commanders may be working together during an actual operation without the opportunity to rehearse, and, therefore, theater commander standard operating procedures (SOP) may not exist.

Fiscal constraints force efficiency. If a JFFCC is to be established, with an inherent cost in manpower and support systems, it must be necessary. If the impact of advanced NSFS systems on land combat operations is not significant, then perhaps current doctrine and procedures are sufficient.

### Research Approach

Certain measures of effectiveness must be identified to compare land-based fire support versus sea-based fire support to determine if revolutionary vice evolutionary changes in joint fire support coordination will be required. The methodology used to support this thesis was to use likely scenarios to ascertain the relative impact of advanced NSFS capabilities on land combat operations. The advanced NSFS's potential target area was compared the land commander's

organic fire support potential target area. The fire support weapons capabilities of a future Army heavy force (circa 2005) was compared to the advanced NSFS capabilities of a future naval task force (circa 2005). A simple quantitative analysis was conducted to determine the potential target area of each. Qualitative factors were then analyzed to determine the relative impact of advanced NSFS given the quantitative analysis.

#### Anticipated Outcomes

This author anticipates that fire support capabilities will continue to improve for all of the services. These improvements will include extended ranges and increased lethality. This will require more sophisticated coordination schemes, but not necessarily more elaborate organizations. In either case, joint doctrine must be formulated to provide the acquisition community the framework from which to design the command and control support systems and to allow personnel managers to forecast manning and training requirements. It is expected that advanced NSFS systems will cause an evolution of joint doctrine and procedures to some degree. Though it is difficult to forecast the precise impact of these systems, it is necessary to resolve these issues to ensure a combat effective joint team.

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<sup>1</sup>U.S. Army, Field Manual 100-5, Operations (Washington, DC: Department of the Army, 1993), 6-14.

<sup>2</sup>Jane's Naval Weapon Systems (Alexandria, VA: Jane's Information Group Limited, 1996), 41.

<sup>3</sup>U.S. Joint Chiefs of Staff, Joint Pub 3-56.1, Command and Control of Joint Air Operations (Washington, DC: Joint Chiefs of Staff, 14 November 1994), 1-1.

<sup>4</sup>U.S. Joint Chiefs of Staff, Joint Pub 3-56.1, Command and Control of Joint Air Operations (Washington, DC: Joint Chiefs of Staff, 14 November 1994), 1-2.

<sup>5</sup>Daniel J. Murphy, "Call for Fire" Surface Warfare 21, no. 3 (May/June 1996): Inside Cover.

<sup>6</sup>Chris Ange, "Naval Surface Fire Support" Surface Warfare 21, no. 3 (May/June 1996): 6.

<sup>7</sup>Edmund R. Anderson, Jeffrey J. Barrat, and Craig R. Welterlen, "TSTAR: Tomahawk Stops The Attacking Regiments" Surface Warfare 21 no. 2 (March/April 1996): 15.

<sup>8</sup>James W. Canan, "A Ship for All Reasons" Sea Power 39 no. 10 (October 1996): 36.

<sup>9</sup>Ibid.

<sup>10</sup>Ibid., 38.

<sup>11</sup>Scott C. Truver, "Floating Arsenal to be the 21st Century Battleship" Jane's International Defense Review 29 (July 1996): 46.

<sup>12</sup>Kenneth T. Lyons, "Extended Range Guided Munition" Surface Warfare 21, no. 3 (May/June 1996): 8.

<sup>13</sup>Scott Norton, "Naval Surface Fire Support Advanced Technologies" Surface Warfare 21, no. 3 (May-June 1996): 18.

<sup>14</sup>Dennis Morral, "Naval Surface Fire Support, Fire Support Missile Options" Surface Warfare 21, no. 3 (May-June 1996): 13.

<sup>15</sup>Dennis Morral, "Naval Surface Fire Support, Fire Support Missile Options" Surface Warfare 21, no. 3 (May-June 1996): 13.

<sup>16</sup>Dennis Morral, "Naval Surface Fire Support, Fire Support Missile Options" Surface Warfare 21, no. 3 (May-June 1996): 13.

<sup>17</sup>Jane's Naval Weapon Systems (Alexandria, VA: Jane's Information Group Limited, 1996), 41.

<sup>18</sup>Edmund R. Anderson, Jeffrey J. Barrat, and Craig R. Welterlen "TSTAR: Tomahawk Stops The Attacking Regiments," Surface Warfare 21, no. 2 (March-April 1996): 14.

<sup>19</sup>Edmund R. Anderson, Jeffrey J. Barrat, and Craig R. Welterlen "TSTAR: Tomahawk Stops The Attacking Regiments," Surface Warfare 21, no. 2 (March-April 1996): 15-16.

<sup>20</sup>Joseph C. Schissler, "ATWCS, A Step Into the Future" Surface Warfare 21, no. 5 (September-October 1996): 39.

<sup>21</sup>O. Kelly Blosser, "Naval Surface Fire Support, Mission Planning and Coordination" Surface Warfare 21, no. 3 (May-June 1996): 27.

<sup>22</sup>James L. Davis and Stephen D. Cifruk, "ADOCS: An Automated Approach to Targeting" Field Artillery (August 1994): 36.

<sup>23</sup>O. Kelley Blosser, "Naval Surface Fires and the Land Battle" Field Artillery (September-October 1996): 45.

<sup>24</sup>Lawrence E. Creevy, "JPSD 'Navy' Summary," Delivered at Naval Air Systems Command, 30 October 1996.

<sup>25</sup>U.S. Joint Chiefs of Staff, Joint Pub 3-02, Joint Doctrine for Amphibious Operations (Washington, DC: Joint Chiefs of Staff, 8 October 1982), VI-1.

<sup>26</sup>U.S. Army, Field Manual 100-15, Corps Operations (Washington, DC: Department of the Army, 1 June 1996), 2-5.

<sup>27</sup>U.S. Army and U. S. Marine Corps, Field Manual 6-20-10/MCRP 3-1.6.14, Tactics, Techniques, and Procedures for the Targeting Process (Washington, DC: Department of the Army/U. S. Marine Corps, 8 May 1996), 1-1.

<sup>28</sup>U.S. Navy, "Naval Fires, A Fighting Concept for the 21st Century," Draft (Norfolk, VA: Naval Doctrine Command, 15 August 1996): 10-11.

## CHAPTER 2

### LITERATURE REVIEW

#### Introduction

This chapter will summarize the state of joint and service fire support doctrine and review the trends which may be identified by the available literature. “Joint doctrine offers a common perspective from which to plan and operate, and fundamentally shapes the way we think about and train for war . . . Military doctrine presents fundamental principles that guide the employment of forces.”<sup>1</sup> Therefore, the starting point for this review is the joint doctrine publication series. All service doctrine, tactics and procedural guidance should comply with, and support joint doctrine. The actual application of combat power is guided by service doctrine, tactics, and procedures. A review of service fire support doctrine will reveal how the Navy can be expected to integrate the advanced naval surface fire support systems into a joint operation.

Unpublished Master of Military Art and Science (MMAS) theses and monographs are excellent sources for the military researcher as they represent a reserve of research which is relatively complete and oriented towards military subjects. However, direct application of this research may not be possible due to the intent of the previous research. Work that has not yet been published may also benefit the researcher by providing fresh insight into a certain problem, or set of problems. An examination of the few unpublished works with application to the present research question will be accomplished as a lead into articles in professional journals. These articles represent the most current thought with regard to the development of doctrine and

tactics. They generally fall into two categories. In journals sponsored by the service, the articles tend to be informative. Their purpose is to keep the discipline's community abreast of current affairs. Other journals provide an open forum to debate current issues. These articles tend to be argumentative in nature and tend to provide an honest critique of current trends. The chapter will complete with a brief look at other sources and a summation of the patterns and gaps in current literature.

This review of the literature concerning fire support, in particular naval surface fire support, is not exhaustive. The subject is discussed at many levels, from broad doctrinal principles to specific radiotelephone procedures used to call for fire support. The intent is to provide the background necessary to understand current trends and developments and initiate research in further inquiries. The bibliography of this thesis may provide a researcher with additional sources to be studied.

### Joint Doctrine

There are three joint doctrine publications which establish a foundation for any student of joint operations: Joint Publication (JP) 1, Joint Warfare of the Armed Forces of the United States; Joint Publication (JP) 0-2, Unified Action Armed Forces (UAAF); and Joint Publication (JP) 3-0, Doctrine for Joint Operations. These publications provide the basis for the organization of joint forces and provide the structure for their employment. Joint Publication (JP) 1-02, Department of Defense Dictionary, Military and Associated Terms, is the reference for the definition of joint terminology and should be made available to any person studying joint doctrine.

The general doctrinal guide for joint fire support, Joint Publication (JP) 3-09, Doctrine for Joint Fire Support has not been approved. It is in a draft which is being reviewed by joint and service staffs. It is expected to be published in late 1997. A review of the draft publication finds that it will: define joint fire support terminology, provide joint force and component fire support agencies and linkages, and review planning and coordination processes.

The draft JP 3-09 places the responsibility for joint fires and fire support on the Joint Force Commander's Director of Operations (J-3). In operations where the fire support problem may be complex, the addition of a section chief, known as the Joint Force Fires Coordinator (JFFC), is suggested. Unfortunately, the annex which described J-3 augmentation required to form a Joint Force Fires Coordination Cell (JFFCC) has been removed from the draft. It suggested one level of augmentation which consisted of approximately twenty personnel. Though each operational situation would require a different level of support, the suggested organization might provide the structure necessary to form a JFFCC. The material which remained concentrates on reviewing current service specific organizations and offers nothing new in this area.

A thorough review of fire support planning and coordination principles is included in the draft JP 3-09. This review provides operators with common principles and procedures for the current structure of fire support organizations. Fire support control and coordination measures are defined, and service specific mission descriptions are reviewed. A review of the draft publication allows the researcher to understand the current precepts for employment of fire support. These precepts are in a state of flux as the contributing commands come to agreement on a number of items, including the name of the JFFC.<sup>2</sup> As a name has not officially been

decided, JFFC and JFFCC will continue to be used in this study as they are in current official publications.

Many approved publications will support JP 3-09, including joint operations doctrine publications. These include primarily Joint Publication (JP) 3-02, Joint Doctrine for Amphibious Operations, and Joint Publication (JP) 3-09.3, Joint Tactics, Techniques, and Procedures for Close Air Support (CAS). Two other doctrinal publications which will be subservient to JP 3-09 are Joint Publication (JP) 3-09.1, Joint Laser Designation Procedures and Joint Publication (JP) 3-09.2, Joint Tactics, Techniques, and Procedures for Radar Beacon Operations (J-Beacon). However, these publications have no direct impact on surface fire support. All of these publications are current doctrine and support JP 3-09 as drafted with little need for change.

JP 3-02 is the authoritative reference for current joint doctrine on naval surface fire support (NSFS). Though the focus is on amphibious operations planning and execution, many of the precepts would be applicable in other NSFS employment. In amphibious doctrine, fire support is handled as a subdivision of supporting arms. The "Supporting Arms Planning" chapter describes how NSFS would be applied as part of the combat power used to enable the movement of troops ashore and onto their objectives, until field artillery can be positioned ashore to support the landing force. The coordinating agencies are described, as well as fire support coordination measures and planning responsibilities. The NSFS planning section details requirements, sequencing considerations, essential elements and employment techniques.

A more general survey of fire support is included in JP 3-09.3. The emphasis here is on close air support (CAS). However, the need to integrate and coordinate fire support is recognized and doctrinal techniques and procedures reviewed. Fire support coordination measures, such as the Fire Support Coordination Line (FSCL), Free-Fire Area (FFA), No-Fire

Area (NFA), Coordinated Fire Line (CFL), Restrictive Fire Line (RFL), and other measures, are defined in this publication to ensure that they are understood by all planners. Techniques for the integration and separation of CAS and other fire support, especially artillery are discussed as well.

Established joint doctrine, tactics, and procedures for application of airpower in an interdiction role have been employed successfully in operations and exercises. Therefore, this model could be used as a case for employment of naval surface fire support in the ground campaign. The framework for the organizations which execute air interdiction is contained in Joint Publication (JP) 3-03(T), Doctrine for Joint Interdiction Operations, and Joint Publication (JP) 3-56.1, Command and Control of Joint Air Operations. These publications provide the context under which airpower is applied in support of operations beyond the area generally considered under the influence of ground forces and also for providing CAS to ground operations. Procedures for the establishment of joint organizations which will plan and execute joint air operations might serve as a model for the establishment of joint organizations for planning and executing joint fire support operations.

Current joint doctrine provides the principles under which all military operations will be conducted. Much of the joint publication series provides joint organizational structure and specific procedures. As is the case in joint air operations, doctrine is well established. However, a review of current and projected joint fire support doctrine indicates that there is no joint organization for the control of joint fire support. Service specific organizations will be relied upon to coordinate fire support between component commanders. This would indicate that the integration and coordination of NSFS would be dependent on the organizational structure intended to provide fire support to amphibious operations.

## Service Doctrine

Deep operations are not defined as a joint term. However, it is in the Army's deep operations where the advanced naval surface fire support weapons would prove very useful in the ground campaign. The Army provides the framework for the battlefield's organization in its capstone warfighting publication Field Manual (FM) 100-5, Operations. In FM 100-5, three sets of activities are defined to establish responsibility and to develop a planning methodology for the breadth and depth of the battlefield: close, deep, and rear operations. Deep operations are defined here, and the foundation is laid for the establishment of more specific procedures for deep operations in FM 100-15, Corps Operations, and its associated tactics and procedures publications, including those standard operating procedures (SOP) developed by individual commanders. As the JFLCC is most likely to come from the Army, the principles of Army doctrine for the application of fire support could be used as the foundation of a concept for the application of advanced naval surface fire support weapons in support of the ground campaign.

Two Army organizations are of interest to the student of fire support: the Deep Operations Coordination Cell (DOCC) and the Fire Support Cell (FSC). These cells operate at the Army Corps level to integrate and coordinate internal fire support assets with other external deep fire assets. The concentration of effort for the FSC is on the control of fire support assets and on ensuring adequate fire support is available for the corps' mission at the right place and time. The DOCC is tasked specifically with the planning, executing and synchronizing of all deep operations. The DOCC has the responsibility of providing an interface with the Joint Targeting Coordination Board (JTCCB), the corps targeting cell, and the linkage with joint and organic fires. Further, the DOCC must develop the detection and delivery concepts necessary to accomplish deep operations. Therefore, it is the DOCC which will be the organization most

involved in the integration and coordination of naval fire support into the deep operations of the JFLCC.

Corps Deep Operations Tactics, Techniques and Procedures Handbook provides an excellent review of the tactics, techniques and procedures that a U.S. Army corps would use in planning and executing deep operations. It provides a good overview of the organizations at echelons above corps that would facilitate deep operations and corps command and control of deep operations. An outstanding source for the specific organization and procedural guidance for a DOCC can be found in V(US) Corps Field Standing Operating Procedures, Deep Operations Annex. This annex begins with a review of deep operations doctrine and tactics. It proceeds to discuss the specific deep operation's team members, assets, and the systems used to coordinate functions, such as ADOCS and AFATDS.

At times, two or more services or services' components will coordinate the publication of doctrine or tactics to mutual benefit. The Army and Marine Corps combined efforts to publish FM 6-20-10, Tactics, Techniques and Procedures for the Targeting Process (Marine Corps Reference Publication (MCRP) 3-1.6.14). It is an outstanding treatise on: targeting doctrine and methodology, targeting in a joint environment, and targeting at all levels of Army and Marine Corps structures. It is currently the only official document which describes the JFFC. As such, it is not , currently, an approved joint doctrinal position. The JP 3-09 will establish the official duties and responsibilities of the JFFC. FM 6-20-10 provides a concept where the JFFC will act as the action officer for joint fire support issues and as executive agent for the JTCB.

Specific fire support procedures are provided in FM 90-20, J-Fire, Multi-Service Procedures for the Joint Application of Firepower, for all services. J-Fire was developed by the Army Training and Doctrine Command, the Marine Corps Combat Development Command (as

Fleet Marine Force Reference Publication (FMFRP) 2-72), the Air Force Air Combat Command (as Air Combat Command Publication (ACCP) 50-28), and the Commander in Chief, U.S. Atlantic Fleet (as Commander in Chief, U.S. Atlantic Fleet Instruction (CINCLANTFLTINST) 3330.5). It provides a pocket-sized, quick reference for fire support requests.

Amphibious operations have long been the focus for naval forces in conducting NSFS. Therefore, most of the doctrinal literature for NSFS is found in those publications dealing with amphibious doctrine. The study of NSFS, however, would not be complete without first reviewing the overarching naval doctrine publication (NDP) series which provide the basis for all naval operations. The keystone of this series is NDP 1, Naval Warfare. NDP 1 outlines the principles under which naval forces (Navy and Marine Corps) are organized, trained, equipped, and employed. Further amplification of the current philosophy of the Navy can be found in the 1994 white paper, . . . From the Sea and the 1996 revision Forward . . . From the Sea.

Two publications should be reviewed to understand the organization of naval fire support. The specific guide for amphibious operations fire support is Naval Warfare Publication (NWP) 22-2 (Revision C), Supporting Arms in Amphibious Operations (Fleet Marine Force Manual (FMFM) 1-7). NWP 22-2 (Revision C) is the guide for naval commanders for coordination of supporting fire planning and delivery and of landing force fire support requests. It is meant to be a supplement to JP 3-02. It describes the organization and procedures used to provide fire support in amphibious operations, including naval gunfire, CAS, and Marine Corps artillery. The organization, functions, and responsibilities of the key agencies are provided. These include the Supporting Arms Coordination Center (SACC) for the Navy and the Fire Support Coordination Center (FSCC) for the Marine Corps. Both organizations very much parallel the DOCC in form and function. Fleet Marine Force Manual (FMFM) 2-7, Fire Support

in Marine Air-Ground Task Force Operations, serves the same purpose as NWP 22-2 (Revision C), while focusing on Marine Corps operations specifically, without the amphibious emphasis.

Naval Doctrine Command is responsible for developing the doctrine necessary to employ new weapon systems. A naval fires concept paper has been in development at Naval Doctrine Command with expectations that it will be approved for release in 1997. The paper "Naval Fires, A Fighting Concept for the 21st Century" is an attempt to project what constitutes, and how best to employ, advanced NSFS. The emphasis is on how to integrate, rather than coordinate, joint fire support, and therefore introduces the concept of an Engagement Integration Center (EIC). The distinction is that integrated fire support would entail a process of collaborative planning and execution of fire support so that effects are reinforcing and complementary, and would combine to achieve a mutual objective. Whereas, coordinated fire support concentrates on timing and location of fire support and maneuver forces to avoid fratricide and duplication of effort. The EIC concept would push joint fire support beyond the JFFCC. The paper recommends that the JFFCC should evolve into an Engagement Integration Center (EIC).

Service specific doctrine and procedural manuals provide the structure for fire support organizations. Combined service manuals, FM 6-20-10 and the naval fires concept paper, specifically, provide for the establishment of a JFFC. Development of the JFFC concept is necessary to define the support structure for this individual. An individual responsible for the coordination, or integration, of the fire support from all service components of a joint force would need an organization to plan and execute joint fire support.

### Unpublished MMAS Theses and SAMS Monographs

A number of unpublished papers have been produced by U.S. Army Command and General Staff College and School of Advanced Military Studies students on the subject of fire support and deep operations. There is little material on the subject of NSFS. However, there are papers which indicate the direction which joint fire support command and control is headed.

Two monographs examine the status of NSFS and its current capability to support forced-entry or amphibious operations. Both P. M. Strain's "Amphibious Operations in the 21st Century: A Viable Forced-Entry Capability for The Operational Commander" and J. G. Wilson's "Examination of Naval Surface Fires in Support of Future Amphibious Operations" indicate that there is a need to develop advanced NSFS. Both works use historical examples and the current world situation to validate the requirement to conduct forced-entry operations and assess the current state of NSFS.

Several papers have been dedicated to the problem of how deep fire assets are controlled. Ground commanders desire control of deep fire assets so that they can use them to shape the close battle. Air Force commanders desire control of deep fire assets to multiply the effects of the interdiction efforts. Major M. J. Eshelman tackles this debate in "Air Commander Control of Army Deep Fire Assets." The monograph uses a three-step methodology to examine whether Army deep fire assets should be apportioned by the Joint Force Commander (JFC) against interdiction targets which may or may not directly affect the close battle.

The Army Training and Doctrine Command's "Deep Operations Coordination Cell (DOCC) Analysis" is representative of many theses and monographs which have sought to refine the mission, structure, and systems associated with Army deep operations in general and the DOCC in particular. Some studies have focused on the effect of weapon systems, such as

ATACMS, or command and control systems, such as ADOCS, on fire support. Others have focused on organizational solutions to the problem of how to best fight the deep battle. Many have concentrated on trying to determine where control of deep fire assets should shift between the JFLCC and JFACC. Perhaps, the real issue is what process should occur when the JFLCC's plans to shape the deep battle overlap or conflict with the JFACC's plans to shape the deep fight.

As surface fire support weapon systems improve, the ability of an artillery or NSFS commander to affect the region formerly under the influence of airpower alone has increased tremendously. Coordination of these assets and effective application of combat power to accomplish JFC objectives is important across all functional areas. For this reason many wrestle with who should control the deep fire support assets. There is little material on how this control, coordination, or integration should be executed beyond the current service specific organizations.

#### Articles In Professional Journals

Professional military journals may yield great benefit to the researcher as they are often open forums for the discussion of current doctrinal concepts. Often, the researcher will find that he or she is not the only person looking at a particular aspect of a problem. However, some professional military journals are sponsored by a specific service or branch within that service. As such, this second category of professional military journals is a tool to keep military personnel informed as to the direction that systems acquisition and doctrine development are headed. Some journals are found which support both purposes open forum and informational.

Journals which fit into the first category and address the subject of fire support are the Naval Institute Proceedings and the Military Review. Proceedings is a particularly good example of this type of journal. Its editors publish articles from a wide variety of authors,

including active duty and retired naval officers and sister service officers, midshipman, international officers, and various civilian authorities. A striking example of the second example is Surface Warfare, published by the Office of the Director, Surface Warfare Division, Chief of Naval Operations. Many of the articles are written by staff officers as part of their duties of system acquisition and doctrine development. Such publications offer information on subjects which can only be garnered through internal issue papers, defense contractor proposals, and other unpublished sources. In the third category are journals such as Sea Power and Field Artillery. The Navy League of the United States publishes Sea Power to keep its members abreast of current topics in naval warfare and operations. Field Artillery, published by the Department of the Army under the auspices of the U.S. Army Field Artillery School, is used to disseminate professional knowledge and furnish information as to the Field Artillery's progress. Though specifically service sponsored with many articles written by officers from the Field Artillery School, it appears to attempt a balance with articles from sister service officers and civilians.

A thorough review of the current Naval Surface Fire Support programs can be found in the May/June 1996 edition of Surface Warfare with ten articles covering the progress in naval gunnery and missilery. The March/April 1996 edition includes, "TSTAR, Tomahawk Stops the Advancing Regiments" which reviews the concept of the antiarmor version of the Tomahawk land attack missile (TLAM). The October 1995 Sea Power, provides an excellent synopsis of naval surface fire support (NSFS) developments in "Target of 2001 Set For NSFS" by E. J. Walsh. Mr. Walsh updates the status of these programs in the October 1996 edition with "Surface Navy Arms for Land-Attack Role."

Authors in professional journals have endorsed advanced NSFS weapons which would replace the loss of firepower that resulted with the decommissioning of the U.S. Navy's battleships. "The Fix Is In: Fire Support Returns" by C. T. Morgan in the October 1996 Proceedings and "The Quick Strike Submarine" by J. N. Giaquinto, L. L. McDonald, and J. P. Madden, Jr., in the June 1995 Proceedings offer strong support for the advanced NSFS systems. There are few contrary opinions to be found. The few found in this research revolve around the reactivation of the Iowa class battleships, such as "Not So Fast" by C. E. Myers, Jr., also in the June 1995 Proceedings.

The number of articles dealing with the arsenal ship is particularly interesting. Research has begun on this vessel which is being designed as an NSFS weapon platform for the littoral mission emphasized in Forward . . . From the Sea. The arsenal ship would hold about five hundred missiles of various types, such as Tomahawk, ATACMS, etc., and provide significant on call firepower to joint forces. Though the future of the arsenal ship has not been determined, a joint Defense Advanced Research Project Agency (DARPA) and Navy program has been established with five competing contractor teams awarded \$1 million each to develop initial designs. Each of the naval professional journals Proceedings, Surface Warfare, and Sea Power have a series of articles which are keeping abreast with developments in this program. The case of the arsenal ship emphasizes that the Navy will eventually have significant amounts of firepower available to joint forces which will require significant coordination measures.

Field Artillery, with its focus on the surface fire support mission, is an excellent source for the current thought on deep operations and surface fire support in general. The April 1993 edition dedicated seven articles to deep operations concepts and practices. The October 1993 edition emphasized coordinating joint fire support, including, "Preparing for the Purple

Battlefield” by Major General J. A. Dubia and a review of current NSFS by J. Gordon IV “Naval Fire Support and the Force Projection Army.” O. K. Blosser provides an excellent review of advanced NSFS in “Naval Surface Fires and the Land Battle,” in the September-October 1996 Field Artillery. This edition also provides seven other articles on fire support modernization under the general heading “Digitizing the Force.” A thorough overview of ADOCS can be found in the August 1994 “ADOCS: An Automated Approach to Targeting” by J. L. Davis and S. D. Cifrulak, while the same may be said of “Hell Fires Deep: The DOC---An Integrated Approach,” which concerns the structure and procedures within a deep operations cell.

Professional journals’ articles on fire support are numerous. Many deal with expressing the requirements for new systems or report the procurement and modernization of programmed systems. Few present concepts for or against the JFFCC which was originally proposed in the draft of JP 3-09. While most of the authors argue for more capability, there are not many ideas present in the journals reviewed to indicate what organizational changes might need to be made, if any, to accommodate these new capabilities.

#### Other Literature

The concept papers which supported funding the development of the advanced NSFS systems all emphasize the capability these weapons would provide to the Navy to support a ground campaign. The focus of these documents is on the technical difficulties of adapting Army ordnance to naval weapon launch systems, adaptive use of available technology, and the capabilities that such systems would provide to land forces. Specifically, the mission needs statements (MNSs) which support funding, and the operational requirements documents (ORDs) which provide system requirements for acquisition provide detailed information with respect to

acquisition justification and objectives. The MNSs and ORDs for advanced NSFS systems make evident that the Navy is reacting to the shift in the focus from blue-water capabilities to littoral operations. Particularly evident in these documents is the change in nature of the U.S. Army and U.S. Air Force from a deterrent force which is forward deployed to a force projection team. This fundamental change has necessitated the acquisition of naval systems which can deny and delay an invasion of a friendly nation and contribute to the air-land counteroffensive after sufficient ground forces have been deployed.

A relatively impartial source of military technical information is the Jane's Information Group Limited. Jane's, as it is commonly referred to, publishes a series of books and magazines which track the development of military weapons systems. Fred T. Jane was the founding editor of All The World's Fighting Ships, first published in January 1898. The series of handbooks on the technical aspects of naval ships included critical commentary on technological developments and naval tactics.<sup>3</sup> Current products of the Jane's Information Group Limited include Jane's Defence Weekly, Jane's International Defense Review, and a series of books, updated each year, such as Jane's Naval Weapon Systems. Jane's has reviewed the progress of the acquisition of advanced NSFS systems in all three of the series mentioned. An exceptional summary of the current programs can be found in "Floating Arsenal to be 21st Century Battleship," in the July 1996 edition of Jane's International Defense Review.

#### Summary

A review of current doctrine was accomplished to determine if a need exists for the development of doctrine associated with these future weapons systems. There is no doctrine currently established for advanced naval surface fire support executed in direct assistance of a

ground campaign. Procedures are well established for the joint application of firepower which includes naval gunfire. These procedures have been extracted from the amphibious doctrine and tactics which are also well established. Though doctrine for naval surface fire support in amphibious operations is well established and has direct applicability, it is oriented towards the command and control structure which evolved to execute the unique mission of amphibious assaults and raids. There is no doctrine nor procedures which provide for the direct application of advanced naval surface fire support to sustain Army ground operations.

Doctrine developed to accomplish coordination or integration of joint fire support must be developed to complement existing doctrine. In particular, Army doctrine which involves the application of fire support to deep operations should be the basis for the interoperability of the concept and structure. The command and control structure which accomplishes the ground forces commander's objectives against enemy forces beyond those that are in immediate contact with friendly forces must be the foundation for a joint organization with the same purpose. The DOCC is the focus of these efforts.

Research material is available in sufficient amounts to study advanced NSFS. Current NSFS doctrine and tactics appear to be on the verge of a critical development in the command, control, and coordination (or integration) of the systems which are expected to be acquired in the near future, as well as existing systems. While some of the literature discusses broad concepts, the details are sketchy. Little qualitative or quantitative analysis seems to have been accomplished to justify the development of a JFFCC (or EIC), especially with regard to the impact that advanced NSFS weapons will have. While a qualitative judgment may allow one to accept these developments without analysis, it is reasonable to assume that such an analysis is

worthy to support the funding of additional manpower and systems support to this new organization.

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<sup>1</sup>U.S. Joint Chiefs of Staff, Joint Pub 1, Joint Warfare of the Armed Forces of the United States (Washington, DC: Joint Chiefs of Staff, 10 January 1995): vi.

<sup>2</sup>U.S. Army, "Joint Agreements from Army-Air Force Warfighter Conference" [telecommunications message] (Washington, DC: Department of the Army, 191947Z December 1996): 2.

<sup>3</sup>Richard Brooks, "How Fighting Ships Became Jane's," U.S. Naval Institute Proceedings 122 (December 1996): 44-47.

CHAPTER 3  
RESEARCH METHODOLOGY

Introduction

The objective of this effort is to establish that there is a significant transition in naval surface fire support capabilities which may occur in the relatively near future and to determine whether these capabilities are substantial enough to require the development of additional joint doctrine, tactics, and procedures to ensure their successful employment. In particular, does an organization need to be established, the JFFCC, due to the introduction of advanced NSFS weapons? Or, will current doctrine, tactics, and procedures be sufficient? An examination of both quantitative and qualitative factors will be accomplished to answer these questions.

The research methodology consists of two phases. First, a quantitative assessment of the relative impact of advanced NSFS will be developed. A comparison of NSFS to ground commanders' organic fire support will allow for this comparison using the most significant measure. This comparison will be accomplished for high-volume weapons systems, naval guns and artillery, and medium-volume weapons, missiles. The low-volume fire support weapon, cruise missiles, will not be included in the quantitative assessment because its cost will likely prevent many from being available. The second phase will be the application of the comparison in a qualitative assessment of three organization models.

A variety of factors will be used as a basis for the qualitative assessment. The primary factors considered will be the principles of war and how the organization models affect them.

The impact of the low-volume weapon system will be considered in the qualitative assessment. Also, a crude cost benefit analysis will be accomplished, as a precise analysis is not possible within the scope of this study. However, consideration must be given to the relative cost of each of the organization models.

#### Measures of Effectiveness

Quantitative factors, or measures of effectiveness (MOE), offer the decision maker substantive data for the comparison of courses of action. MOEs can often answer the question, How much better is Alternative A over Alternative B? Qualitative factors may provide a relative ranking of alternatives, but they do not provide the means to determine the comparative value of one alternative over another. "A measure of effectiveness . . . must be closely related to the objective of the operation."<sup>1</sup> In fire support, there are a number of quantitative factors which may be considered by the decision maker in assessing its impact. These include weapons effects, relative firepower, and potential target set.

Weapons effects are attributed to a type of ordnance based on its potential effect on a particular type of target. Firepower, "the product of military forces,"<sup>2</sup> may be measured in a number of ways, such as ordnance available, rate of fire, or some combination of factors. As the weapons effects of the systems to be compared are very similar, and firepower can be adjusted by increasing or decreasing force levels no matter the systems, these factors will not be considered in this study.

The potential target set is a function of the area of enemy territory that friendly units can engage with fire support weapons, the identification of the types of targets in that area, the disposition of targets in that area, and the suitability of the weapons for those targets within that

area. The suitability of a weapon system is dependent on its effects. As these effects are very similar for the comparison groups, as noted above, and it is not possible to control the disposition of targets with an enemy's territory, this study will concentrate on the area of influence. In assessing the need for coordination, it seems natural that the most important factor is the overlap of areas of influence. Therefore, development of a MOE to compare the areas of influence of the comparison groups will be accomplished.

#### Potential Target Area

The MOE which will be calculated for comparison is the potential target area that fire support weapons provide. The potential target area of current naval gunfire, current ground commanders' organic fire support, advanced NSFS, and future ground commanders' organic fire support will be calculated. This data can then be compared to determine the relative impact of the proposed weapon systems. Of interest will be the amount of overlapping coverage and the additional area coverage provided by advanced NSFS, both of which are dependent on the geography. Overlapping coverage will necessitate coordination measures, while additional potential target area will indicate the relative benefit of the advanced capabilities. This comparison will provide a measure of the impact of advanced NSFS on joint operations.

The calculations will be completed for historical scenarios, including the Korean War, the Vietnam War, and Desert Storm. These contemporary scenarios represent a key tenet of U.S. National Military Strategy, the capability to fight and win a major regional conflict.<sup>3</sup> The threat of conflict still exists on the Korean Peninsula and in the Middle East. Many scenarios could be considered. However, these are contemporary examples, and provide distinctly different geography. Lesser contemporary conflicts also reviewed include: Lebanon, Panama, and

Grenada. However, the assessment of these conflicts will be limited to the potential target area for advanced NSFS only.

### Qualitative Factors

A qualitative assessment of the need to establish the JFFCC, based on advanced NSFS, will be accomplished using the quantitative analysis for a basis. The principles of war will be used as the factors for consideration. Each of the nine principles would be affected to some degree by the combination of the addition of advanced NSFS to a scenario and a method of coordinating the new weapon systems. As noted, three organization models will be used as a basis for the comparison.

Each of the three models met a set of conditions to be considered: feasibility, acceptability, and suitability. This is commonly referred to as the F-A-S Test and applied to a course of action (COA) development. Feasibility asks the question, Do we have the resources required to establish the model? Acceptability asks the question, Is establishing the model agreeable in terms of personnel, time, and materiel? Suitability asks the question, Will establishing the model accomplish the mission of coordinated joint fire support?<sup>4</sup> The answer to each question is assumed to be 'yes' for each model. The key to this study will be in weighing the factors considered to determine which model is the best alternative.

The first model examined will be a simple liaison officer exchange. In this case, ground and naval forces officers with requisite skills and knowledge are traded for the duration of operations. These officers would be tasked with coordinating the efforts between the naval and ground components. They have little authority; rather, they serve to facilitate information exchange. Liaison officers serve as advisors to the command to which they are dispatched and

are responsible to their parent commands. Liaison officers are used to support coordination when the two JFC components are operating in the vicinity of each other with separate objectives.

The second model would involve expanding the capabilities of Air and Naval Gunfire Liaison Companies (ANGLICO) to encompass control and liaison employment of advanced naval surface fire support as well as traditional gunfire and close air support (CAS) capabilities. The ANGLICO Companies could then be assigned to joint forces land component commanders (JFLCC) for control of advanced naval surface fire support assets in ground campaigns. This case would develop established procedures to meet the needs of new capabilities. The ANGLICO Companies could be provided to ground commanders in the same manner as Air Support Operations Centers (ASOCs) and Tactical Air Control Parties (TACPs) function. The ANGLICO Companies are generally used when ground and naval components have mutually supporting roles.

The third model examined will be the establishment of a new organization, a JFFCC. The JFFCC would report to the Joint Forces Commander (JFC) and be responsible for the employment of all joint fire support weapons in the campaign. This case is ambitious and will require the development of much of the joint tactics and procedures to support the doctrine presented in the draft publication JP 3-09. This situation is warranted when the components' efforts are integrated for the support of a mutual goal.

One method of analyzing a new or revised organization within an institution is to compare the new organization with one which is familiar. The doctrinal establishment of the JFFCC would modify the current notional structure of the staff of a JFC. Established under the JFC are a number of organizations which might be used as a pattern for comparison. These

include the Joint Targeting Coordination Board (JTCB), Joint Forces Air Component Commander (JFACC), the Joint Search and Rescue Coordinator (JSRC), Joint Special Operations Task Force (JSOTF), and others. For purposes of the thesis, the JFACC's organization appears to be the most likely candidate. The JFACC accomplishes a function for the JFC which is similar to that accomplished by the Deep Operations Coordination Cell (DOCC) for the Army if used as a Joint Forces Land Component Commander (JFLCC). Both organizations coordinate the use of firepower in support of campaign objectives to ensure mass of effects and economy of force. The JFFCC would perform functions similar to the DOCC, only for the JFC. If an Army commander was serving as the JFC the JFFCC might include the DOCC in its organization. The JTCCB would monitor the functions of the JFFCC and JFACC to ensure that they are consistent with the JFC's operational plans.

A review of the JFACC and DOCC organizations will be used to compare the DOCC structure and functionality with that of the JFFCC. A review of the structure of the SACC will also be used for comparison as this organization accomplishes a similar function for the Amphibious Task Force.

#### Summary

This study will consist of two phases in attempting to answer the thesis question, Will the acquisition of advanced NSFS weapons require a significant change in the way fire support is coordinated, specifically, the establishment of a JFFCC? First, the relative impact of advanced NSFS will be established using potential target area as a MOE for comparing current and future NSFS and organic ground units' fire support. Second, the quantitative assessment will be used as the basis for evaluating three models of coordination versus the principles of war.

Given qualitative and quantitative measures of the impact of advanced NSFS on joint fire support operations, it is hoped that one will be able to draw some conclusions as to the relative need for a JFFCC. The development of a team (the JFFCC) and its associated materiel support will have a definite cost. The benefit of putting the team together must outweigh the cost.

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<sup>1</sup>United States Naval Academy Naval Operations Analysis, Operations Analysis Study Group (Annapolis, MD: Naval Institute Press, 1977), 13.

<sup>2</sup>U.S. Army, Field Manual 100-5, Operations (Washington, DC: Department of the Army, 1993), 6-7.

<sup>3</sup>Joint Chiefs of Staff, National Military Strategy (Washington, DC: Joint Chiefs of Staff, 1995), ii.

<sup>4</sup>U.S. Army Command and General Staff College, Student Text 101-5, Command and Staff Decision Processes (Fort Leavenworth, KS: U.S. Army Command and General Staff College, February 1996), 3-2.

## CHAPTER 4

### ANALYSIS

#### Potential Target Area

The development of potential target areas was completed by a simple map analysis. The actual areas were calculated by measuring subordinate areas by hand and adding them together. Therefore, there is an inherent error in the calculations which could be as high as 10 percent. This is considered acceptable as the aim is to establish relative impact vice a precise measurement. There are many factors which would affect the application of surface fire support and its potential target area. Therefore, a number of assumptions were made before the map analysis was conducted. While individual assumptions may be argued, the results obtained should clearly identify a trend which is unlikely to be argued.

The entering argument for this measure of effectiveness is the range of the weapons systems. The potential target area was calculated for: the present U.S. naval gunfire weapon system (NGFS-P), the future naval gunfire weapon system (NGFS-F), the present U. S. Army artillery capability (ARTY-P), the future U. S. Army artillery capability (ARTY-F), the naval version of ATACMS (N-ATACMS), the present ATACMS (ATACMS-P), and future ATACMS (ATACMS-F). The assumed ranges were taken from open sources and are shown in table 1. The sources were chosen to maximize consistency in the assumed data. Different weapons systems ranges can be found in various sources. However, few sources provided the range of data necessary for this study. Naval gunfire and artillery ranges were based upon the maximum

effective possible ranges using rocket assisted projectiles, given the maximum ranges projected by open source documents. It was assumed that targeting information would be available to at least the range of the available weapons. Therefore, the potential target area includes all the area that the weapons systems may range.

Table 1. Assumed Weapons Systems Ranges

Weapon System	Range (km)	Source
NGFS-P	21	<u>Surface Warfare</u> <sup>1</sup>
NGFS-F	100	<u>Surface Warfare</u> <sup>2</sup>
ARTY-P	30	Jane's <sup>3</sup>
ARTY-F	50	Jane's <sup>4</sup>
N-ATACMS	140	Jane's <sup>5</sup>
ATACMS-P	124	Jane's <sup>6</sup>
ATACMS-F	140	Jane's <sup>7</sup>

A benign environment was considered for naval forces. It was assumed that the threat to naval forces was minimal from the beginning or had been neutralized. Therefore, the position from which naval gunfire could be provided was dependent on the geography of the coast line and the depth of the water, rather than the need to maintain a safe distance from coastal weapons systems or mines. While it may be argued that this is not likely, it is safe to assume that the threat to naval forces would be significantly reduced in an area of operation before units would be dedicated to fire support in that area. The naval 'gun line' developed from these assumptions was generally five kilometers from the coast to avoid shoal water and provide sufficient maneuver space for ships. The gun line did not enter restricted waterways, such as harbors, and was clear of enemy islands.

The Army artillery line was based upon a historical situation in each of the three scenarios. In both the Korean and Vietnam scenarios, the base artillery line was assumed to be the demilitarized zone. In addition, the potential target area was calculated for the area adjacent to the western border of Vietnam in Cambodia and Laos as the Ho Chi Minh Trail traversed through this region. The North Vietnamese Army staged in these areas, specifically during the Nguyen Hue Offensive of 1972. The base artillery line for Operation Desert Storm was assumed to be at the line of departure for the ground offensive which began 24 February 1991. This is essentially the Saudi-Kuwaiti border to Iraq, then due west to the furthest disposition of coalition troops.

The assumptions made provide only a snapshot of each conflict. Each snapshot is a simple linear model which ignores some physical constraints of the weapons systems. For example, a terrain analysis was not accomplished to determine if artillery could be placed along the entire length of the artillery line. The security of the weapons systems along those positions was ignored in the calculations as well. These considerations led to coining the term “potential target area” (PTA) for this study. Precise calculations would have prevented the development of multiple examples. The strength in this analysis is the consideration of a number of contemporary historic examples, each with dissimilar geography and its unique perspective. As discovered in chapter 2, it does not appear that this type of analysis has been attempted in developing fire support coordination doctrine.

#### The Korean Peninsula Conflict Scenario

The potential target area calculations for the Korean Peninsula scenario show a significant impact of advanced NSFS on the fire support possibilities. The raw data provided in

table 2 leads one to the conclusion that the increase in potential target area with advanced NSFS (NGFS-F or N-ATACMS) is rather dramatic in this scenario. The increase in high-volume NSFS alone is about eightfold. This was to be expected given the significant increase in range of the future weapons systems. However, two observations are particularly interesting in this scenario.

The first observation is that the area of North Korea that can be reached by advanced NSFS would be 85 percent of the total area (120,538 square kilometers) by the medium-volume system (N-ATACMS) and 68 percent by the high-volume weapon system (NGFS-F). The limitations of geography would only allow ground commanders organic fire support to target 28 percent of the North Korean total area from the demilitarized zone. A second observation is that advanced NSFS would be the only surface fire support able to target the area around the North Korean capital of Pyongyang.

Table 2. Potential Target Area - Korean Peninsula Conflict

Weapon System	PTA (km <sup>2</sup> )
NGFS-P	10,480
NGFS-F	81,395
ARTY-P	6819
ARTY-F	11,935
N-ATACMS	103,237
ATACMS-P	30,250
ATACMS-F	34,176

The area where weapons systems potential target areas overlap, or coordinated fire area (CFA) provides a measure of the need for coordination. The CFA was determined for present and future systems, then simple ratios calculated to investigate how much of the ground

commander's surface fire support PTA could be influenced by NSFS. Table 3 provides the raw data. The ratio of present NSFS CFA to the present ground commander's surface fire support PTA is only 8 percent for high-volume systems and 7 percent for both systems combined. Advanced NSFS would radically change the CFA ratios. The ratio of future NSFS CFA to the future ground commander's surface fire support PTA increases radically to 77 percent for high-volume systems and 100 percent for medium-volume systems.

Table 3. Coordinated Fire Area - Korean Peninsula Conflict (km<sup>2</sup>)

	ARTY-P	ATACMS-P	ARTY-F	ATACMS-F
NGFS-P	550	2,060	N/A	N/A
NGFS-F	N/A	N/A	9,185	28,425
N-ATACMS	N/A	N/A	11,935	34,176

#### The Vietnam Conflict Scenario

The potential target area calculations for the Vietnam Conflict scenario show a significant impact of advanced NSFS on the fire support possibilities as well. Two cases will be examined in this scenario. The first is calculations assuming that only territory in North Vietnam proper could be targeted. The second will assume that targets in Cambodia and Laos are also 'fair game.' The second case will be referred to as the Indochina Subset. The raw data for the two cases is provided in tables 4 and 5. Analysis of the Indochina Subset will only consider the additional PTA available by including Cambodia and Laos. The subset as analyzed is interesting as the PTAs considered involve land mass which is not contiguous to the coast. The small additional PTA which could be added to the NSFS figures at the southern end of Cambodia is ignored because it was little used by the belligerents in the conflict.

Each of the two cases of this scenario provides interesting observations. The first case reinforces the trend noticed in the Korean Peninsula scenario, that advanced NSFS provides a dramatic increase in the potential target area, again close to eightfold for the high-volume weapon system. As in the Korean Peninsula scenario, N-ATACMS and NGFS-F will provide a surface fire support capability throughout the majority of enemy territory. Again in this scenario, the medium-volume NSFS (N-ATACMS) would be able to engage targets in the vicinity of the enemy capital, Hanoi in this case. The ground commander's organic surface fire support would be very limited without maneuver due to the geography of the demilitarized zone.

The second case may also lend support to the premise that advanced NSFS may precipitate a need to alter fire support coordination doctrine. In the Indochina Subset, the ground commander's organic fire support has the distinct advantage due to the geography. However, advanced NSFS could play a role while the present NGFS could not. Advanced NSFS might have been able to provide additional relief to the South Vietnamese Armed Forces during the Nguyen Hue Offensive, also known as the Easter Offensive, in military regions one and two.

In military region one, the northern most region, North Vietnamese armed forces were able to capture the provincial capital of Quang Tri and threatened the old Imperial capital, Hue. In military region two, North Vietnamese armed forces threatened to split South Vietnam in two at Highway 19, near Pleiku. U.S. fire support may have made the difference in each region.<sup>8</sup>

NGFS was a critical factor in delaying the enemy's advance in military region one north of Dong Ha, but could not engage the enemy on its northwest avenue of approach nor the enemy's support bases in Laos. As weather prevented air assets from attacking, the North Vietnamese were able to take Quang Tri and threatened to take Hue. NGFS was not a factor in

military region two, where the South Vietnamese held at Kontum until a counteroffensive was executed. The potential target area of advanced NSFS includes all of those areas.

Table 4. Potential Target Area--Vietnam Conflict

Weapon System	PTA (km <sup>2</sup> )
NGFS-P	8,690
NGFS-F	66,190
ARTY-P	1,800
ARTY-F	3,000
N-ATACMS	85,190
ATACMS-P	7,440
ATACMS-F	8,640

Table 5. Potential Target Area--Indochina Subset

Weapon System	PTA (km <sup>2</sup> )
NGFS-P	0
NGFS-F	11,125
ARTY-P	33,890
ARTY-F	55,690
N-ATACMS	33,125
ATACMS-P	136,350
ATACMS-F	153,790

The coordinated fire area (CFA) calculations for the Vietnam scenario reinforce the idea presented in the Korean Peninsula example. Tables 6 and 7 provide the raw data. In the North Vietnam proper case, the ratio of present NSFS CFA to the present ground commander's surface fire support PTA is only 3 percent for both high-volume systems and for the systems combined. Advanced NSFS would radically change the CFA ratios in this scenario as well. The ratio of

future NSFS CFA to the future ground commander's surface fire support PTA increases radically to 100 percent for both high-volume systems and for medium-volume systems.

The CFA change is not as dramatic in the Indochina subset, except that the CFA is zero with present NGFS. The current NGFS system cannot reach those areas of Cambodia and Laos used by the North Vietnamese. The ratio of future NSFS CFA to the future ground commander's surface fire support PTA increases to 9 percent for the high-volume weapons systems and 18 percent for the medium-volume weapons systems. While the percentage of the ground commander's surface fire support PTA which overlaps the advanced NSFS PTA may not be very large, it is significant that the ground commander would have the option of NSFS and would need to coordinate its delivery, in an area which is not contiguous with the coast.

Table 6. Coordinated Fire Area--Vietnam Conflict (km<sup>2</sup>)

	ARTY-P	ATACMS-P	ARTY-F	ATACMS-F
NGFS-P	480	1,984	N/A	N/A
NGFS-F	N/A	N/A	3,000	8,640
N-ATACMS	N/A	N/A	3,000	8,640

Table 7. Coordinated Fire Area - Indochina Subset (km<sup>2</sup>)

	ARTY-P	ATACMS-P	ARTY-F	ATACMS-F
NGFS-P	0	0	N/A	N/A
NGFS-F	N/A	N/A	5,000	10,000
N-ATACMS	N/A	N/A	15,000	27,000

## The Operation Desert Storm Scenario

The potential target area calculations for the Operation Desert Storm scenario may confirm a trend that shows significant impact of advanced NSFS on the fire support possibilities. As Kuwait Bay hampers the application of present NGFS, the advent of advanced NSFS in this scenario increases the PTA by about ten times. In this scenario, geography limits the impact of NSFS due to the restricted waters and shorter coast line. However, advanced NSFS would have been useful in covering the escape routes used by the Iraqi Republican Guard. There has been much lament over their escape; N-ATACMS and ERGMS, to a lesser extent, can engage targets in the Basra area of Iraq, through which some of the Republican Guards traveled.

Table 8. Potential Target Area - Operation Desert Storm

Weapon System	PTA (km <sup>2</sup> )
NGFS-P	2,240
NGFS-F	21,318
ARTY-P	11,250
ARTY-F	18,500
N-ATACMS	26,118
ATACMS-P	43,700
ATACMS-F	48,700

The coordinated fire area (CFA) analysis for Operation Desert Storm provides similar, though not as dramatic, results. Table 9 provides the raw data. The ratio of present NSFS CFA to the present ground commander's surface fire support PTA is only about 4 percent. Advanced NSFS would increase the CFA ratios in this scenario as well. The ratio of future NSFS CFA to the future ground commander's surface fire support PTA increases to 41 percent for high-volume systems and 44 percent for medium-volume systems. The CFA for advanced NSFS in this

scenario would include most of Kuwait and, therefore, the bulk of enemy troops and equipment which were targeted to provide maneuver forces an advantage in defeating the Iraqi defenses in Kuwait.

Table 9. Coordinated Fire Area - Operation Desert Storm (km<sup>2</sup>)

	ARTY-P	ATACMS-P	ARTY-F	ATACMS-F
NGFS-P	480	2,080	N/A	N/A
NGFS-F	N/A	N/A	7,500	17,500
N-ATACMS	N/A	N/A	9,500	21,600

#### Summary

It appears relatively evident that the impact of advanced NSFS is significant when compared to the present NGFS system. The potential target area increased from eight to ten times in the scenarios examined. The area that overlaps between NSFS and the ground commander's organic, surface fire support increased dramatically as well. The revised coordinated fire area as a fraction of the ground commander's potential target area ranged from 0.09 to 1.0. The low figure is from the Indochina subset where the area under consideration is not adjacent to the sea. Otherwise, the lowest ratio is 0.41. The coordinated fire area ratio could increase from ten to thirty times in the future. In three other scenarios considered: Lebanon, Grenada, and Panama; advanced NSFS could range the entire area of each country. If the density of targets in even one of the smaller CFAs was high, then, the need for coordination might be very great. This quantitative assessment of advanced NSFS indicates that the need for an increase in the capability to coordinate joint surface fire support exists.

The low density fire support weapon, TLAM BLK IV (AA) must also be considered in this analysis. Its range would provide coverage of the entire battlefield in each of the scenarios reviewed. This strengthens the argument that advanced NSFS weapons may significantly impact joint force fire coordination. The use of Tomahawk cruise missiles is currently coordinated through the JFACC in interdiction and strategic attack roles. An antiarmor capability would make Tomahawk an outstanding deep fires and fire support asset for the JFLCC. The coordination scheme currently used to employ Tomahawk might not be responsive enough to allow its optimal employment in this role.

An additional benefit of these improvements in NSFS for the force projection army is that maneuver forces could be deployed in some situations covered only by NSFS. The redundant potential target area might allow a joint force commander to better prioritize critical air and sea lift resources. In the early stages of a deployment naval assets could be ordered to provide surface fire support to light or heavy maneuver forces until their organic fire support can be deployed. This might allow the joint commander to deploy more robust maneuver forces immediately, or use light maneuver forces with a higher degree of success.

#### Principles of War

“The principles of war guide warfighting at the strategic, operational, and tactical levels. They are the enduring bedrock of US military doctrine.”<sup>9</sup> Joint and service doctrines recognize nine principles of war: objective, mass, maneuver, offensive, economy of force, unity of command, simplicity, surprise, and security. This section will address the relative value of the three organization models versus these principles of war.

The three models: the liaison officer (LNO) model, the ANGLICO model, and the JFFCC model will be ranked using each principle as the factor. Then, the models will be assessed versus all the principles combined to ascertain which model is most appropriate given the impact determined in the previous section. This method is similar to the method used to assess courses of action (COAs) in the deliberate decision making process employed by the U.S. Army. Though this method employs a logic process, it must be understood that there is a subjective nature to it. The method depends on assessing a COA, or in this case a organization model, in light of all possible factors to minimize the impact of the subjective nature.

### Objective

“The purpose of the objective is to direct every military operation toward a clearly defined, decisive, and attainable objective.”<sup>10</sup> If the joint force commander defines the operational objective(s) precisely, the fire support organization model might have little effect on focusing service fire support agencies which are already focused. Each component commander can concentrate on a clearly stated objective without intricate coordination methods. With regard to objective, none of the organization models is considered definitively better than any other.

### Mass

“The purpose of mass is to concentrate the effects of combat power at the place and time to achieve decisive results.”<sup>11</sup> Synchronization of fire support can be very complicated. Fire support coordination measures must be planned in both time and space to ensure that the maximum desired firepower can be brought to bear on an enemy. Only centralized control can ensure the desired effects of mass. Therefore, the more centralized organization model will

better provide mass effects. The JFFCC organization model centralizes fire support planning and execution much more than is found in the LNO model and significantly more so than the ANGLICO model. The JFFCC model is ranked first, followed by the ANGLICO model, then the LNO model.

#### Maneuver

“The purpose of maneuver is to place the enemy in a position of disadvantage through the flexible application of combat power.”<sup>12</sup> As fire support often facilitates maneuver, rapid coordination and assistance in execution of fire support is highly desirable. The organization model which would best affect the maneuver of forces would be the one which is most directly responsive to the maneuver commander. The ANGLICO team brings an organization which is trained and equipped for this role. If the JFFCC did not exist then the ANGLICO team could respond quickly to the ground commander’s requirements without any need to clear fires with the joint agency. Therefore, the ANGLICO model is ranked first. The LNO model does not adequately support continuous, intense operations. Therefore, the JFFCC model is ranked second, and the LNO model is ranked last.

#### Offensive

“The purpose of an offensive action is to seize, retain, and exploit the initiative.”<sup>13</sup> The principle of offensive requires responsive maneuver and fire support forces. A commander can only seize the initiative if the appropriate force can react quickly. It would seem that fire support reaction time would be a factor of the number of communication nodes a fire support request had to go through and the level of expertise at the commander’s unit to request that support in the most efficient manner possible. A joint force commander might find the JFFCC model the most

responsive, while a component commander might find the ANGLICO model more responsive. Therefore, these models will be considered even with regards to the principle of offensive, with the LNO model ranked last.

#### Economy of Force

“The purpose of the economy of force is to allocate minimum essential combat power to secondary efforts.”<sup>14</sup> Economy of force is the corollary to mass and speaks to efficiency, which, like mass, is best influenced by a centralized control scheme. A centralized planning and execution agency would have authoritative access to resource information from all components. A central agency could ensure the optimum distribution of firepower, minimizing redundant efforts. Therefore, the JFFCC model is ranked first, followed by the ANGLICO model, then the LNO model.

#### Unity of Command

“The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.”<sup>15</sup> This principle yearns for an agency like the JFFCC to ensure coordination and cooperation under a single authority. Unity may only be achieved with a nested concept or structure. Unity of command, like mass and economy of force, therefore, results in the JFFCC model ranking first, followed by the ANGLICO model and the LNO model.

#### Simplicity

“The purpose of simplicity is to prepare clear, uncomplicated plans and concise orders to ensure thorough understanding.”<sup>16</sup> It might be assumed that the simplest model would rank first with regard to this principle of war. However, once again, the JFFCC model out performs the

others. The joint commander's plans for fire support will be the most clear and concise if the necessary expertise is resident on or at his staff. Only the JFFCC model provides that expertise. Therefore, the JFFCC model is ranked first, followed by the ANGLICO model, then the LNO model.

### Surprise

"The purpose of surprise is to strike the enemy at a time or place or in a manner for which it is unprepared."<sup>17</sup> Though the responsiveness considered decisive in evaluating the principle of offensive would come to bear here, it seems that the key factors in surprise: effective intelligence, deception, operations security, speed of execution, and an innovative plan; contribute more to surprise than any coordination plan. With regards to surprise, none of the organization models is considered definitively better than any other.

### Security

"The purpose of security is to never permit the enemy to acquire unexpected advantage."<sup>18</sup> Security, like surprise and objective does not appear to be decisively affected by any particular organization model. Other combat functions such as: intelligence, air defense, and mobility/survivability seem to have greater influence on security than do fire support and maneuver.

### Summary

As discussed here, the JFFCC fire support organization model has a distinct advantage over the other models when evaluated against the principles of war. Of the nine principles, this model seemed to out weigh the others in four of the nine. It was tied for the first ranking once.

Only once did the ANGLICO model rank ahead of the JFFCC model. In each of the other three principles of war the fire support organization model was not considered to be a decisive factor in applying that principle to operations.

The dramatic increase of potential target areas and coordinated fire areas calculated in the three scenarios indicate that there will be an increasing need to coordinate and integrate surface fire support. Integration is necessary to maximize combat power and minimize redundant effort in joint land combat operations, with coordination necessary to avoid fratricide. An appropriate organizational scheme is necessary to ensure that joint force commanders can provide simple, effective fire support plans that ensure mass, economy of force, and unity of effort. The centralized planning and control functions of the JFFCC seem best to support these ideas, and are in concert with the U. S. joint operations doctrine of centralized control and decentralized execution.

#### Cost Benefit

A thorough cost analysis of the three organization models would include equipment, training and personnel costs. Such a project is beyond the scope of this research. Consideration of cost is necessary, however, in determining the relative worth of the proposed organization. A review of the cost in each area will be attempted. While this analysis is crude, it should provide an indication of the cost.

One associated project which has been initiated within the Department of Defense is the Joint Precision Strike Demonstration (JPSD) Counter Multiple Rocket Launcher (CMRL) Advanced Concepts Technology Demonstration (ACTD). In this project, the unique capabilities of certain precision munitions, including the Tomahawk cruise missile, are being incorporated

into a plan to solve difficult targeting problems for ground forces. The demonstration has resulted in the identification and solution of several Command, Control, Communications, Computers, and Intelligence (C4I) service fire support interoperability problems. The project is concentrating on ensuring that fire support information can be passed between the service fire support systems, specifically, ADOCS and ATWCS.<sup>19</sup> It appears that the equipment which might be required by a JFFCC is in development. Therefore, the cost of equipment might be absorbed to some degree by other programs.

It may be expected that much of the training costs associated with a JFFCC would also be absorbed by other programs. The JFFCC would consist of personnel with targeting and weapons systems expertise. Training of these individuals is already established for existing systems and would be established for new systems by the procurement programs. While the additional personnel necessary to man the JFFCC would cost additional training funds, most of the overhead costs for this training is associated with service training requirements. Training individuals and organizations in the doctrine and procedures of the JFFCC could be incorporated into existing schools. Joint exercises could easily include training in JFFCC procedures with little additional cost.

The cost of the JFFCC in terms of personnel is dependent on the level of responsibility assigned to the organization. The organizations which currently execute fire support coordination, the Amphibious Task Force (ATF) Supporting Arms Coordination Center (SACC), Landing Force (LF) Fire Support Coordination Center (FSCC), and the Army Corps Fire Support Cell (FSC) and Deep Operations Coordination Cell (DOCC), are limited to centralized planning and coordination and some execution functions. Control functions are normally delegated to

subordinate levels. If the JFFCC were limited to a similar level of responsibility, then it seems that the size of the organization should be comparable to these organizations.

The alternative to limiting JFFCC responsibilities to those similar to the SACC, FSCC, FSC, or DOCC is to expand centralized fire support planning and execution responsibilities to a level comparable to how a JFACC plans and executes air operations. The Air Tasking Order (ATO) developed by the JFACC details each mission flown by each aircraft sortie. This level of detail is considered necessary for coordination and deconfliction of air operations to ensure that the Joint Force Commander's apportionment guidance is met in executing the Master Air Attack Plan (MAAP). The result is a joint component functional command staff which may be large and complex. A JFACC staff may be as small as 75 personnel for an at sea enabling JFACC or more than one thousand personnel for a theater campaign.

The JFACC size alternative is not considered necessary for a fire support coordination agency. It is not necessary to match weapon systems to individual targets when planning fire support. Rather, joint fire support coordination measures allow component commanders to coordinate and deconflict fire support to meet the commander's intent with much broader guidance. The fire support agencies noted above are able to accomplish their mission with as few as a dozen personnel and generally have no more than two dozen personnel. The proposal removed from the draft JP 3-09 recommended a JFFCC of about twenty personnel. Though the exact organization would be dependent on the joint force structure and campaign, this seems to be a reasonable estimate.

The cost of forming a fire support planning and coordination cell of about twenty personnel seems to be a paltry expense if it results in more efficient and effective fire support. Equipment and training costs would appear to be absorbed by weapons systems procurement

programs and current joint training. Development of interoperable command and control systems is already taking place. In some situations, the SACC or DOCC might act as the JFFCC as well. This would require minimal augmentation of personnel from other components. It would appear that a JFFCC is an affordable organization.

### Summary

This analysis was accomplished in two phases. The first phase was a quantitative assessment of the relative impact that advanced NSFS will have on joint fire support. It appears that there will be a significant impact. The second phase was a qualitative assessment of the advantages of establishing a JFFCC, given that advanced NSFS will provide greater opportunities for synchronization in joint fire support planning and execution. A JFFCC appears to be necessary with respect to applying the principles of war to fire support coordination, and that it is probably an affordable option.

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<sup>1</sup>Chris Ange, "Naval Surface Fire Support," Surface Warfare 21, no. 3 (May/June 1996): 3.

<sup>2</sup>Ibid.

<sup>3</sup>Jane's Armour and Artillery, (Alexandria, VA: Jane's Information Group Limited, 1996-1997): 619.

<sup>4</sup>Ibid., 618.

<sup>5</sup>Jane's Naval Weapon Systems, (Alexandria, VA: Jane's Information Group Limited, 1996): 41.

<sup>6</sup>Jane's Armour and Artillery, (Alexandria, VA: Jane's Information Group Limited, 1996-1997): 780.

<sup>7</sup>Ibid., 781.

<sup>8</sup>Phillip B. Davidson, Vietnam at War: The History 1945-1975 (Novato, CA: Presidio Press, 1988): 673-734.

<sup>9</sup>U.S. Joint Chiefs of Staff, JP 3-0, Doctrine for Joint Operations, (Washington, DC: Joint Chiefs of Staff, 1 February 1995): 133.

<sup>10</sup>Ibid.

<sup>11</sup>Ibid.

<sup>12</sup>Ibid., 134.

<sup>13</sup>Ibid., 133.

<sup>14</sup>Ibid.

<sup>15</sup>Ibid., 134.

<sup>16</sup>Ibid.

<sup>17</sup>Ibid.

<sup>18</sup>Ibid.

<sup>19</sup>Lawrence E. Creevy, "JPSD 'Navy' Summary," Delivered at Naval Air Systems Command, 30 October 1996.

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

This project sought to answer the question, "Will the acquisition of advanced Naval Surface Fire Support (NSFS) weapons require a significant change in the way fire support is coordinated, specifically, the establishment of a Joint Force Fire Coordination Cell (JFFCC)?" Although further research may be needed to actually define the organization of the JFFCC in doctrine and practice, it seems apparent that NSFS may be about to experience a significant modernization which will require the establishment of a joint fire support agency.

Procurement programs can be canceled quickly, and without warning. However, the number of programs which the U.S. Navy is pursuing indicates that there will be a significant improvement in the range of NSFS by the turn of the millennium. This acquisition includes: improved naval guns, a naval surface fire support missile system, and an antiarmor version of the Tomahawk cruise missile. These systems represent a significant increase in capability, particularly with regards to range. The effect is that NSFS will reach beyond traditional or doctrinal amphibious objectives.

The effects of advanced NSFS were quantified so that they could be compared to fire support systems which are organic to ground combat units. The primary measure of effectiveness evaluated was potential target area. The intent was to measure the area of land that

would be under the influence of the fire support systems compared. Determination of the potential target areas that overlapped was conducted to ascertain specifically the nature of the area where fire support would need to be coordinated. Each of the scenarios studied showed a significant, sometimes dramatic, increase in capability as measured by potential target area and coordinated fire area. Though dependent on the scenario, the potential target area of advanced NSFS could be a tenfold improvement over the current system. The corollary is that this area overlaps a ground commander's organic surface fire support potential target area by 100 percent in two of the scenarios evaluated. The significance is that coordination schemes developed when the overlap was less than 10 percent are probably insufficient and a scheme to integrate fires is now an imperative. The relative impact of advanced NSFS is very significant.

Qualitative assessment of organizational models indicates that liaison officers and teams may have been adequate when NSFS could only influence an amphibious objective area. However, these coordination schemes need to be reconsidered given the relative impact of forthcoming NSFS weapons systems. It must be remembered that this study only assessed improvements in NSFS, artillery, and ATACMS. Other fire support systems, such as attack aviation and nonlethal means are also taking advantage of technology. If there is doubt about the ability of traditional fire support coordination doctrine to handle improvements in NSFS, then the problem is exacerbated if other systems experience significant improvements. Further, traditional fire support coordination schemes are not in consonance with the principles of war. Mass, economy of force, and unity of effort all demand strong centralized planning. Integration of fire support is necessary to ensure its most effective and efficient use given the tremendous capability advanced NSFS provides and its overlap with fire support available organically to ground commanders.

Assuming that the requirement for a joint fire support agency is accepted, the next step is to determine how it should be organized. The JFACC organization is one extreme. Precise control of allocated resources and the demand of air assets by every joint force component at every level necessitated development of a complex organization. However, fire support coordination and control measures are mature and allow plans to be executed with less direct control than in air operations. Fire support planning may be conducted without the precise control associated with air operations planning. Therefore, the modest organizations which currently control fire support in amphibious and Army operations may be a more appropriate model.

A JFFCC of about twenty personnel seems adequate to plan, monitor, and coordinate the application of fire support in joint warfighting. Supporting Arms Coordination Centers and Deep Operations Coordination Centers have successfully accomplished similar planning and execution functions for Amphibious Task Forces and Army Corps with about that number of people. This investment in manpower and in the accompanying equipment and training appears to be an affordable solution.

#### Recommendations

In Firepower in Limited War, Robert H. Scales examined the application of fire support in contemporary military operations, including the primary examples used in this study. His conclusions include that

True flexibility in the orchestration of firepower will be achieved when a company commander or forward observer can talk routinely to a pilot or gun directing officer aboard a ship just as easily as he can converse with an Apache pilot or artillery fire support officer. Recent experience has shown that unnecessary and inefficient control slows response time, confuses instructions, denies or diverts essential firepower, and inevitably gets soldiers killed. Limited war experience indicates that a prudent fire support coordinator will array the firepower at his control to cover as much vulnerable and vital territory as possible . . . He

must be able to mass firepower quickly if it is to have a destructive effect on an elusive enemy.<sup>1</sup>

The projected dramatic increase in fire support capability leads one to believe that the doctrinal foundation must be laid to ensure optimal application of fire support. Joint doctrine should be developed to facilitate the planning and execution of joint fire support.

The Joint Force Fires Coordination Cell should be established in doctrine. A standard structure for the JFFCC should be developed. Tactics and procedures should be developed to support the integration of this cell into the organizations of joint force commanders. Acquisition managers should continue to develop interoperable automated fire support systems, such as AFATDS and ATWCS, which could be used by the JFFCC to plan and coordinate.

Development of the JFFCC concept in joint doctrine will prevent a Joint Force Commander from developing an ad hoc organization to coordinate joint fire support, when it is relatively obvious from this study that the requirement exists.

#### Suggestions for Further Study

An area which warrants additional study includes further defining the impact of advanced NSFS on joint fire support. An issue which will require significant research is analyzing which fire support missile is the best choice for NSFS. Once program decisions have been made, research will need to be accomplished to determine the appropriate mix of types of NSFS weapons in the available launch platforms. Studies will need to be accomplished to assess the sufficiency of current fire support coordination measures when advanced NSFS weapons are introduced.

Another area which is fertile ground for study is the development of doctrine for the Joint Force Fires Coordination Cell and collateral issues. Should the JFFCC have tasking

authority or should it act as an integrator for the force and advisor to the JFC? What is the right mix of personnel to man the JFFCC? Should there be standing JFFCC teams or should each one be assembled as situations evolve?

Technological advancements in weapons systems will continue to force military planners to assess doctrine, tactics, and procedures as long as man goes to war. Armed forces can only attain and maintain the advantage over adversaries when they correctly assess the impact of new technology and make the appropriate doctrinal changes.

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<sup>1</sup>Robert H. Scales, Firepower in Limited War (Novato, CA, Presidio Press, 1995): 293.

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